

Reality Check: The Presence and Perceived Importance of Barriers to Entry in the Residential Broadband Market

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Abstract

Explicitly identifying barriers to entry and their characteristics is important not only for the systematic evaluation and prediction of market competition but for imposing a priori obligations on incumbents with market power, and for establishing proper competition policy. Given the lack of competition in the residential broadband access market, this research examines broadband access company executives' perceived presence and importance of entry barriers in the U.S. broadband access market by conducting a mail survey and interviews. The survey analysis identifies four underlying dimension of industrial factors preventing new entry into the market: *product differentiation*, *absolute cost advantages of incumbents*, *post-entry profitability* and *entry costs*. Among them, the *entry costs* factor which contains capital requirements, capital intensity and sunk costs, and government policy is perceived to be significantly more important than the other factors. Interviews with company executives produce major five themes: The difficulty of access to the networks (the presence of essential facilities), the overpricing of leased lines by the ILECs to drive up new entrants' costs, the ILECs' predatory pricing to consumers, the political power of incumbents biasing the regulation and legislation, difficulty in access to capital in the presence of regulatory uncertainty, and the financial and technological limitations of alternative access technologies.

1. Introduction

Explicitly identifying the presence of barriers to entry and their characteristics is very important, not only for the systematic evaluation and prediction of market competition, but also for imposing *a priori* obligations on the incumbents with market power and for establishing a proper competition policy. Although market entry barriers are crucial industrial factors that influence the market share and profit of firms already in the market, very little empirical research has specifically examined barriers in the telecommunications and broadband industry. Given the lack of competition in the residential broadband access market, this paper conducted a mail survey and interviews to examine the presence of barriers to entry and the perceived importance of entry barriers in the residential broadband access market. The underlying industry-level factors that prevent new entry into the market are also investigated by using a factor analysis based on the previous literature. It should be noted, however, that the survey does not demonstrate the presence or absence of barriers to entry by themselves but produce the perceived presence and importance of barriers to entry. The ultimate purpose of this research is to contribute to the debate over new telecommunications policy decisions by identifying barriers to entry in the market, if any, and by suggesting which barriers should be addressed by the government in the interest of promoting a more competitive market.

2. Research Objectives

New competitors consider more than a single barrier to entry when they enter the market, and they are not likely to weigh each barrier equally and individually (Karakaya, 2002). This research project aims to examine the importance of barriers to entry as perceived by executives of broadband access providers and the possible presence of entry barriers based upon a survey and interviews. The following research questions are addressed:

RQ1. Which entry barrier(s) is perceived as the most important in deterring businesses from entering residential broadband markets?

RQ2. What are the underlying dimensions of barriers to entry in the residential broadband access market?

Recently, the FCC produced a Notice-of-Inquiry (NOI) questioning the market practice in the broadband services market. The NOI seeks information on the behavior of broadband market participants, including how broadband providers are managing Internet traffic on their networks today and whether providers charge different prices for different speeds or capacities of service (FCC, 2007, March 22). Responding to the inquiry, the results of this research project provide insights into market practice associated with competition and barriers to entry that may contribute to relevant policy development. In addition, the research will add theoretical insights into the previous barrier studies by verifying the importance of barriers to entry in the real market situation.

1. Literature Review

The concept of barriers to entry has been defined differently based on whether it focuses on above-normal profits of incumbents (Bain, 1956) or cost difference between incumbents and new entrants (Stigler, 1968).¹ Based upon this distinction, previous economic literature discussed which industrial factors should be included as barriers to entry in general terms. Bain (1956) identifies *economies of scale*, *capital requirements*, *absolute cost advantages*, and *differentiation advantages* as important factors that can create barriers to entry. Stigler only includes *absolute cost advantages*, *access to distribution channels*, *switching costs*, *brand loyalty* and *vertical foreclosure* excluding economies of scale and capital requirements as important industrial factors that deter a new entry. From the strategic management school perspective, Porter (1980) specified six major sources of barriers to entry: *economies of scale*, *product differentiation*, *capital requirements*, *switching costs*, *access to distribution channels* and *cost advantages* independent of sale such as favorable access to raw materials and government subsidies.

Most empirical studies have been limited to an industrial analysis focusing on which industry has more (or higher) barriers compared to other industries (Bain, 1956; Schmalensee, 1989; Carlton & Perloff, 2005). As it is important in many antitrust contexts to go beyond the Bain and Stigler definitions, which takes into account the dynamics of entry (Carlton, 2005 and McAfee et al., 2004), researchers should consider market-specific characteristics since barriers in deterring entry of competitors into markets vary by product and industry (Karakaya & Stahl, 1989; Yang, 1998).

1.1 Barriers to Entry in the Telecommunications Market

As identified by Ford, Koutsky and Spiwak (2005), two critical factors drive the entry decision in the telecommunications market: (1) post-entry profitability and (2) entry costs. Firms will enter a market only if they expect to make a positive post-entry profit—the authors identified that market size, the intensity of price competition, the level of product differentiation and the existence of rival networks would determine the post-entry profit of a new entrant. The second factor, entry costs are also negatively associated with new entry into the U.S. local exchange markets, suggesting that a decrease in entry costs leads to a higher probability of entry (Ford, et al., 2005; Xiao and Orazem, 2005; Rosston & Wimmer, 2001).

Also, economies of scale have been one of the most important features in the telecommunications network industry, regardless of whether it is considered an entry barrier or not. While Stigler's definition of barriers to entry (that does not include economies of scale) has been well accepted among modern economists, some economists identify scale economies as a critical barrier (Geroski, et al., 1990; Nahata & Olson, 1989; Gabel, 2002).

Providing residential telecommunication services requires firms to incur substantial upfront investments in physical plant and advertising. A great portion of the investment will be irrecoverable in the event of exit. The irrecoverable costs are called sunk costs. Sunk costs are

¹ For a detailed comparison, please see McAfee et al.(2004) and Park & Taylor (2006).

particularly important when new entrants decide to enter the residential telecommunications business, which requires considerable investments to construct local distribution networks and advertisement (Ford, et al., 2005). Xiao and Orazem (2005) found in an empirical study that sunk costs are the main determinant of entry in the residential broadband access market. The interaction of sunk costs with economies of scale to create barriers occurs in the telecommunications market (Gabel, 2002; Sidak, 2006). Furthermore, regulation and competition policy will greatly influence a decision of new entry by changing environmental factors (Alexander & Feinberg, 2004; Brown & Zimmerman, 2004; Rosston & Wimmer, 2001; Abel & Clements, 2001).

1.2 Previous Analyses of Barriers to entry in Several Industries

Several pioneering empirical studies from marketing and business schools deal with a wide range of manufacturing and retail industries: they provide a relevant theoretical framework and methodological suggestion for this research paper. Karakaya and Stahl (1989), in a mail survey of 60 *Fortune 500* companies, identified cost advantages of incumbents, product differentiation of incumbents, capital requirements, customer switching costs, access to distribution channels, and government policy as important barriers to entry. Amongst these factors, the cost advantages of incumbents are perceived as the most critical for all market entry decisions. The capital requirements barrier and product differentiation barrier follow as the second and the third most important barriers in both consumer and industrial goods markets. Expanding this study, Karakaya and Stahl (1992) identified 25 market entry barriers again in consumer markets. The first factor “incumbent structural advantage” listed 13 barriers dealing with the cost and structural advantages of incumbents. The second factor “incumbent market strength” included seven barriers that were related to brand recognition by consumers as well as other company strengths. The third factor “entrant financial investment” comprised five investment-related barriers to entry.

Karakaya (2002) extended the previous studies about consumer markets into the industrial market and conducted a mail survey of 500 industrial firms. From the 93 companies, which responded, it was found that a majority of business executives consider cost advantages and capital requirements to enter markets as the two most important barriers to entry followed by incumbents’ access to a superior production process, capital intensity of the market, and customer loyalty. In addition, he identified four factors: firm specific advantages, product differentiation, cost of market entry and profit expectation of entering firms. In terms of relative importance, the cost of market entry had a significantly higher score compared to the other factors.

These studies are important because they were the first to empirically examine the relative importance of entry barriers. To summarize, business decision-makers perceived that new entrants would decide their entry based on the absolute cost advantages held by incumbents, capital requirements for entering a market, and product differentiation. In particular, capital requirements in industrial markets seem perceived more critical than in consumer markets

2. Methodology

2.1 Data Collection

The FCC reports that the number of high-speed Internet service providers increased significantly from 105 in 1999 to 552 in 2004. If providers with less than 250 lines are included, the total number of providers was 1269 in June, 2005. This increasing number indicates that many smaller companies are operating locally. However, since there was no comprehensive list of broadband access service providers available, two resources were used to formulate a survey company list: *Hoover's Online Database* and a company-member list from Comptel, a trade association in the telecommunication market.

The same survey procedure was conducted twice over a time period of three months, first for companies from Hoover's Online Database and later for companies from the Comptel list.² First, 312 companies chosen from *Hoover's Online Database* were mailed a personalized cover letter addressed to an executive per company, who is in a position to make a market entry decision or contribute to the decision (e.g., CEO, president, vice president or vice president of marketing). An implied consent form, a two-page of questionnaire and a postage-paid return envelope were mailed as well. The questionnaire listed 25 barriers to entry and asked respondents to rank them according to their perceived importance to his or her firm/industry. The executives were asked either to respond to the paper questionnaire offline and send it back to the researcher by mail or to submit the responses online.

Second, after a month, the second survey was sent out to 133 broadband access companies obtained from the Comptel list, which were not duplicated in the previously conducted survey. They were mailed a questionnaire following the same procedure as indicated above. This second round was intended to gain more responses because the first survey produced a low response rate (< 10%). We obtained an endorsement from Comptel to encourage their member companies to respond to the survey. Thus, a total of 445 companies were selected and contacted through the two conducted surveys. Still the response rate was not very high possibly because the target was high-ranked executives in the company. Due to address and personnel changes, a total of 28 surveys were not deliverable. The number of responses analyzed for this study turned out to be 53 in total, for a 12% response rate. Even though 100 or more cases would be much preferable for detecting the underlying dimensions, 53 cases would be still acceptable because the clearer the true factor structure, the smaller the sample size needed to discover it (Darlington, *n.d.*). Since this research instrument is based on items that a previous study has identified as items with a clear factor structure, we argue that a smaller number of cases would suffice.

Indeed, when we calculated two diagnostic tests for the adequacy of factor analysis, the tests have all produced satisfactory results. First, the KMO (Kaiser-Meyer-Olkin) measure of sampling adequacy³ was calculated and the result shows that factor analysis can proceed (The KMO value = .704). Second, Bartlett's test of sphericity rejects the hypothesis (at $p < .001$) that

² Refer to <http://www.comptel.org>

³ When the KMO value is above .50, this indicates the adequacy of factor analysis (Colman & Pulford, 2006).

the correlation matrix is an identity matrix, without significant correlations between variables, which confirms that the data are suitable for factor analysis (Colman & Pulford, 2006).

The questionnaire asked the respondents to evaluate the importance of 25 entry barriers on a *Likert* scale ranging from “very important” to “not important at all.” The 25 entry barriers were derived from a previous study (Karakaya, 2002) which measured the barriers to entry in industrial markets. However, as indicated previously, the telecommunications industry has different characteristics from other industrial markets. Thus, a total of 5 items were modified to reflect the specific features of the market situation based on the previous literature. For instance, one item from Karakaya (2002), “incumbents with proprietary product technology” was replaced with “incumbents with essential facilities such as the last mile networks, which may restrict access to new entrants.” The entire list of factors is found in table 2.

2.2 In-depth Interview

To complement the survey, interviews with executives were conducted. The main task in interviewing is to understand the meaning of what the interviewees say (Kvale, 1996). Although interviews are time consuming and resource intensive, they are useful for pursuing in-depth information around a topic. Also, interviews may be useful as follow-up to certain respondents to questionnaires, e.g., to further investigate their responses (McNamara, 1999). Furthermore, unlike with mail surveys, interviews provide the opportunity for an interviewer to probe or ask follow up questions. For this research, a type of standardized and open-ended interview was adopted. The open-ended interview refers that the same open-ended questions are asked to all interviewees. This approach facilitates faster interviews that can be more easily analyzed and compared (McNamara, 1999).

We contacted all 133 companies from the Comptel list, cordially inviting them for an interview by phone. Finally we interviewed executives of a total of 13 companies, some of which already responded to the survey. The interview asked questions similar to the survey but was intended to get information about the current market situation and relevant regulatory issues in depth. Thus, the interview questions addressed the competition level in the respondents’ company’s market, deciding factors in case the company decided not to enter the residential market, and interviewees’ perceptions on what barriers to entry exist in the residential broadband access market, which barriers are most important to the participating company, and which barriers should be tackled by the government (Table 1).

Table 1. Interview Questions

categories	Questions
General Information	<ul style="list-style-type: none"> • How long has your company been at your current address? • Did your company enter the broadband service access market? When? • Do you provide high-speed Internet access service to the residential users? • What access technologies has your company used for the broadband service provision?
Perceived Competition level	<ul style="list-style-type: none"> • Is there competition in the region where your company provides the service? How much?

Deciding factors	<ul style="list-style-type: none"> • If your company decided not to enter the residential broadband market, why not? What was the deciding factor?
Perceived barriers to entry	<ul style="list-style-type: none"> • What barriers to entry exist in the residential broadband access market? • Which barriers are most important to your company?
	<ul style="list-style-type: none"> • What barriers should be addressed by the government? What role should the government take to remove barriers to entry?
	<ul style="list-style-type: none"> • In addition to the barriers you noted, what other obstacles or difficulties exist when your company tries to enter the residential broadband access market?
Others	<ul style="list-style-type: none"> • Any other comments?

On the other hand, to preserve confidentiality, each participant was assigned a code number. The code number is matched with the participants' identity only on a master list—in the analysis, only the interviewee's code number was used. Each interviewee participated on a voluntary basis and they were promised a copy of the final report after the research is done. With a few exceptions, all the ten interviews were recorded and transcribed by the researcher— some interviewees did not want to be recorded.

3. Analyses and Findings

This section reports the results of the survey first and turns to the interview analysis. The survey analysis includes a mean score comparison and a factor analysis that detects the underlying structures of ranked items. The interview produced five main themes based on the question categories (table 1).

3.1 Perceived Importance of Barriers to Entry

Examination of the mean scores indicated that capital requirements (mean = 6.26), capital intensity (mean = 6.09), incumbents with essential facilities (mean = 6.06) were the three barriers perceived as the most important by executives who responded to the survey. Table 2 shows the mean scores and standard deviations for each of the barriers tested.

Table 2. Importance of barriers to entry in the residential broadband access market

Barriers to entry in the residential broadband market	Mean	Std. dev.
Capital requirements to enter markets	6.26	0.763
Capital intensity of the market	6.09	1.024
Incumbents with essential facilities such as the last mile networks, which may restrict access to new entrants	6.06	1.586
Amount of sunk cost involved in entering a market	5.83	1.033
Incumbents with cost advantages due to economies of scope (e.g., tying with video and/or telephone services)	5.51	1.648

Magnitude of market share held by incumbents	5.30	1.409
Incumbents with cost advantages due to economies of scale	5.25	1.807
Incumbents with relatively easy access to necessary equipments and supplies (e.g., vertical integration)	4.98	1.575
Low prices charged by incumbents	4.96	1.860
Heavy advertising by firms already in the market	4.85	1.460
Government policy (e.g., licensing requirements)	4.74	1.903
Amount of selling expense involved in marketing a product	4.72	1.498
Brand identification advantage held by incumbents	4.70	1.600
Incumbents with excess capacity, which may prevents new entrants from offering their services	4.62	1.873
Expected post-entry reaction of incumbents	4.57	1.771
Number of firms in a market	4.51	1.527
Customers' costs associated with switching from one supplier to another	4.38	1.667
Incumbent's easier access to distribution channels (e.g., more selling agents)	4.36	1.699
Incumbents with superior production processes	4.13	1.630
High profit rates earned by incumbents	3.75	1.921
Incumbents with cost advantages due to learning curves (The more experience, the better cost efficiency)	3.68	1.626
Customer loyalty advantage held by incumbents	3.66	1.605
R&D expense involved in entering a market	3.62	1.632
Patent, intellectual property	3.30	1.761
Trade secrets held by incumbent firms	3.15	1.758

Note: Measured on a seven point scale ranging from very important (coded as 7) to not important at all (coded as 1)

3.2 Underlying Dimensions of Barriers to Entry

In order to identify the underlying dimensions of barriers to entry in the broadband access market, the 25 barriers were factor analyzed using principle axis factoring with a varimax rotation. The criteria established in advance of the selection of factor items were: (1) a factor loading of 0.35 or higher; (2) at least a 0.10 difference between the item's loading with its factor and each of the other factors, and (3) interpretability.

In deciding how many factors to retain statistically, Cattell's scree test was utilized.⁴ The scree test showed that there was a marked decrease in downward slope after four and five principal components implying that we can summarize our 25 barriers variables either by the first four or by five principal components. Both four and five factors had eigenvalues of greater than 1.0. Thus, conceptual considerations guided the final decision over the number of factors.

⁴ Traditionally, there are many ways to choose the number of factors but most factor analyses depend on Kaiser's familiar eigenvalue rule or Cattell's scree test. But there are arguably more advanced methods suggested (Darlington, *n.d.*)

Conceptually, four factors made more sense than five factors. With five factors, one factor contained items with no meaningful relationship to one another, e.g., “incumbents with cost advantages due to learning curves” and “number of firms in a market.” In comparison, the four-factor solution produced an interpretable factor structure with barriers loading on the factors in a meaningful way.

Nevertheless, when varimax-rotated factor loadings were run with four factors, two items—“customers’ costs associated with switching from one supplier to another” and “number of firms in a market”—produced statistically weak loadings less than the criterion of 0.35. Thus, they were excluded in the final factor-loadings, resulting in 23 items analyzed. In addition, one item, “incumbents with cost advantages due to learning curves (the more experiences, the better cost efficiency),” was included in Factor 1, product differentiation, even though it is supposed to fit in Factor 2, absolute cost advantages. Low prices charged by incumbents in factor 2 can be arguably a part of product differentiation.

Table 3. Rotated factor matrix showing the underlying dimensions of barriers to entry in the residential broadband market

	Factors			
	1	2	3	4
Factor 1. Product differentiation (M = 4.16)				
Heavy advertising by firms already in the market	.730	.160	.094	.097
Incumbents with cost advantages due to learning curves (the more experience, the better cost efficiency)	.646	.245	.174	-.131
Incumbents with superior production processes	.631	.284	-.007	.064
Trade secrets held by incumbent firms	.596	.118	.517	.112
Customer loyalty advantage held by incumbents	.576	-.153	.146	-.162
Amount of selling expense involved in marketing a product	.544	-.026	.085	.315
Brand identification advantage held by incumbents	.519	.270	.084	.249
Incumbent’s easier access to distribution channels (e.g., more selling agents)	.505	.233	.249	.010
Factor 2. Absolute cost advantages (M = 5.23)				
Incumbents with essential facilities such as the last mile networks, which may restrict access to new entrants	-.157	.802	.157	.251
Incumbents with cost advantages due to economies of scope (e.g., tying with video and/or telephone services)	.344	.693	.250	-.142
Incumbents with relatively easy access to necessary equipments and supplies (e.g., vertical integration)	.409	.672	.070	.112
Incumbents with cost advantages due to economies of scale	.451	.554	.279	.051
Low prices charged by incumbents	.042	.479	.101	.008
Incumbents with excess capacity, which may prevents new entrants from offering their services	.319	.466	.161	.059
Factor 3, Post-entry profitability (M = 4.11)				
Patent, intellectual property	.024	.061	.818	.403
High profit rates earned by incumbents	.150	.230	.807	.028
Magnitude of market share held by incumbents	.228	.249	.568	.143
Expected post-entry reaction of incumbents	.212	.304	.490	.236
R&D expense involved in entering a market	.245	.206	.386	.159

Factor 4 Entry costs (M = 5.73)				
Capital intensity of the market	-.053	.023	.061	.872
Capital requirements to enter markets	.132	.167	.119	.794
Amount of sunk cost involved in entering a market	.126	.156	.277	.694
Government policy (e.g., licensing requirements)	.001	-.130	.385	.539
Eigenvalues	7.3	3.01	1.98	1.62
% of variance explained	31.88	13.09	8.62	7.06
Cronbach's Alpha	.84	.82	.81	.76

The four factors extracted account for 57.4 percent of the variance in the data. In addition, Cronbach's alpha was calculated for each factor to assess the reliability of the resulting scale. The reliability coefficients calculated are 0.84, 0.82, 0.81, and 0.76 for factors 1, 2, 3, and 4 respectively (Table 3). Finally, composite scores were obtained on each factor for every subject by calculating the mean of the relevant item response scores to compare means.

Factor 1: Product differentiation

The first factor accounts for 31.88 percent of the variance and it is labeled as "product differentiation" as suggested by Karakaya (2002), who identified the same factor. A total of eight barriers-to-entry structure this factor including heavy advertising by firms already in the market, customer loyalty advantage held by incumbents, the incumbent's stronger brand identification, amount of selling expense involved in marketing a product, incumbent's easier access to distribution channels (e.g., more selling agents), incumbents with cost advantages due to learning curves (the more experience, the better cost efficiency), incumbents with superior production processes and trade secrets held by incumbent firms. Karakaya had included switching costs as an item in this factor but this variable was excluded as previously indicated. Also, cost advantages due to learning curves, incumbents' superior production processes and trade secrets held by incumbent firms were newly added to this factor. Except for the amount of selling expense involved in marketing a product, all other variables are associated with product differentiation utilizing advertising, superior production processes and distribution channels. Also product differentiation can be achieved from brand power and customer loyalty that incumbents usually benefit from the first-mover advantages.

Factor 2: Absolute cost advantages

The second factor accounts for 13.09 percent of the variance and is labeled as "absolute cost advantages." Absolute cost advantages can be defined as costs that must be borne by the entrant but not by incumbents. This includes the incumbent firm's exclusive or superior access to necessary inputs such as patents, copyright, exclusive contracts with input suppliers and ownership of a network. Most legal and regulatory barriers to entry come under this heading. Cost asymmetries due to the superior efficiency of incumbents, however, should not be included. A total of six barriers to entry make up this factor. Except for low prices charged by incumbents and incumbents with excess capacity, all others appear to be related to absolute cost advantages held by incumbents: the ownership of a network (incumbents with essential facilities such as the

last mile networks, which may restrict access to new entrants), incumbents with cost advantages due to economies of scale, incumbents with cost advantages due to economies of scope, and incumbents with relatively easy access to necessary equipments and supplies (e.g., vertical integration). It should be noted that the incumbent's low prices and excess capacity seem more relevant to the post-entry profit expectation of new entrants. Incumbents' deterrence strategies will function here by reducing the potential competitors' profit opportunities by imposing high costs for new entrants by lessening the market price of a product (Rosenberg and Clements, 2000) rather than by engaging in price competition.

Factor 3: Post-entry profitability

The third factor is labeled as "post-entry profitability" and accounts for 8.62 percent of the variance. The barriers such as high profit rates earned by incumbents, the market share of incumbents, expected post-entry reaction of incumbents, patent, intellectual property, and R&D expense involved in entering a market make up this factor. Both patent and intellectual property and R&D expense involved in entering a market are relevant in that they raise entry costs to new entrants and later operational spending. Thus, they influence expected profitability eventually.

Factor 4: Entry costs

As shown in this factor, capital intensity and capital requirements associated with market entry are barriers to entry for most firms. The amount of sunk cost and government policy also made up this factor. This factor accounts for 7.06 percent of the variance. Traditionally, the telecommunications market has required a tremendous amount of capital, a greater proportion of which is sunk compared to other industries, due to the expenditures involved in the last mile (Miller, 1995; Brock, 1981). Even though there are cost effective alternative technologies such as wireless technologies reducing the market entry costs, new entrants still face huge costs and added risk of sunk investment. Policy constraints such as government licensing requirements are also included in this factor and we estimate that government policy decisions, such as licensing and unbundling rules tends to decisively determine the cost of market entry.

Ford et al. (2005) call the construction of a facilities-based telecommunications network as "technological entry costs" and suggest that technological entry costs are not simply network plant, but consist of any expenditure that is sunk. An economic analysis shows that sunk costs affect entry not only by raising the expected average cost of an entrant relative to that of incumbents but also by their effect on the post-entry unit costs of incumbents (Martin, 2002). In other words, if the extent to which investment is sunk is sufficiently great, then after entry, incumbents will carry excess capacity until it is eliminated by physical depreciation. During this period, the incumbent does not need to gain more capital and the rental cost for capital will be zero. This will lower incumbents' unit cost, reduce an entrant's expected profit, and may make entry unprofitable where it would be profitable if investments were not sunk (Martin, 2002).

Differences among the four factors

To see if any of the factors were different in their importance, we compared the means of the four factors. Factor 4 "entry costs" has the highest mean (=5.73), followed by factor 2

“absolute cost advantages” (=5.23), factor 1 “product differentiation” (=4.16), and factor 3, “post-entry profitability” (=4.11) (Table 3). The results indicate that cost requirements of market entry were perceived as the most important barrier to new entrants in the residential broadband market. This result concurs with findings of the previous studies (Ford, et al., 2005; Xiao and Orazem, 2005; Rosston & Wimmer, 2001).

Other barriers to entry in the survey

The survey questionnaire included two open-ended questions asking respondents to describe other barriers not on the list and other obstacles they want to mention. The responses included incumbents’ control over essential facilities such as the last mile, capital requirements to enter markets and amount of sunk cost involved in entering a market. Incumbents’ superior resources such as human resources and their greater financial capital for lobbying and policy formation were also mentioned by the survey respondents. Several responses indicated lack of access to wide area transport such as tier 1 providers as an additional barrier. Also, recent aggressive pricing by the incumbent telephone companies and government policy were also mentioned in several responses as an obstacle in the competition. Furthermore, the historical advantages of telephone companies, a monopolized network system and low price charged to customers by the incumbent that entrant ISPs could not compete with were cited as the greatest barriers to entry. Other respondents stated, “Technological uncertainty,” “very likely dominance of incumbents in the licensed spectrum” and “turbulent and unpredictable federal regulation”, which can be driving out investors. The interview analysis reported in the next section further examines these points.

3.3 Interview Analysis

In addition to the quantitative analysis of the survey data, qualitative information from interviews with executives from broadband access service providers was used to complement to the survey. A majority of interviews, other than the ones where the respondents refused permission, were recorded using an audio device and transcribed. These interviews with persons who are in a position to make decisions to enter the residential broadband market on behalf of their companies produced the following five themes. Table 4 indicates brief information about participants:

- (1) Access to the incumbents’ networks: network monopoly and the difficulty of access to the networks
- (2) Incumbent phone companies’ predatory retail pricing & overpricing access: lower retail price charged by incumbent phone companies to residential customers than the wholesale price to the leasing ISPs, and overpricing of Incumbent Local Exchange Carriers (ILECs) for leased DSL lines
- (3) Political power of incumbents biasing the regulation and legislation
- (4) Difficulty in access to capital due to regulatory uncertainty
- (5) Financial and technological limitations of alternative access technologies

Table 4. Participating interviewees by characteristics

Business type	The Number of	Rank
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	interviewees	
CLECs (DSL)	7	President, CEO, vice-president, chairman, carrier division manager, vice president of operator services, senior counsel of government affairs
Land-line based broadband ISPs (DSL & Cable)	4	
Wireless	1	
Incumbent (ILEC)	1	
Total	13	

Access to the incumbents' networks

First, all but one interviewee – significantly the one belonging to an ILEC – mentioned “access to the incumbents’ networks” as the biggest barrier to new entrants. They indicated the unbundled network element (UNE) rules as the reason. The respondents alleged that the current U.S. telecommunications market including residential broadband services continues to display significant monopoly characteristics, and access to the last mile is a difficulty. As is well known, the Telecommunications Act of 1996 encouraged competitive entry by requiring ILECs to open their networks to new entrants. With the UNE rules and the regulated pricing of the leased network elements (under TELRIC),⁵ many CLECs and independent DSL providers had opportunities to enter the market rather easily without investing in their own facilities (South East Telephone, 2007). This may have had the adverse impact of discouraging investments by competitive entrants. Thus, to encourage the investment by both ILECs and CLECs, the FCC eliminated all the UNE rules in 2005 by its Triennial Review Remand Order⁶ right after it eradicated most unbundling requirements for all broadband network operators, such as telephone companies and cable companies in 2004.⁷

However, the problem is the following - the deployment of broadband networks into the individual households requires tremendous amounts of investments, and smaller and independent companies will be driven out of the business because of increasing prices and lack of capital. One interviewee with a big CLEC stated, “When you get to the end of debates, the issue is the very last mile of facilities. Those facilities, like two individual houses have copper wires...that would never probably be something that would be economical for many carriers to replicate. The issue is not the entire network; the key at the end of debate is the last mile facilities.”

Interestingly, while the FCC keeps emphasizing that its deregulation is aimed at supporting the market economy, one interviewee points out that the FCC’s deregulation ended up deciding the number of competitors in the broadband market rather than letting the market

⁵ Total Element Long-Run Incremental Cost (TELRIC) rates under Sections 251(c)(3) and 252(d)(1) of the Telecommunication Act of 1996.

⁶ Available at http://www.fcc.gov/wcb/cpd/triennial_review/triennialremand.html

⁷ As indicated in the FCC’s TRRO (2005, Feb.), tracking records of the issue can be found in Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket Nos. 01-338, 96-98, 98-147, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, 17145, para. 278 (2003) (Triennial Review Order), corrected by Errata, 18 FCC Rcd 19020 (2003) (Triennial Review Order Errata), vacated and remanded in part, affirmed in part, *United States Telecom Ass’n v. FCC*, 359 F.3d 554 (D.C. Cir. 2004) (USTA II) cert. denied, 125 S.Ct. 313, 316, 345 (2004).

economy decide: the FCC's deregulation blocks new entrance in the broadband market and reduce the incentives of market entry as well. He stated, "we don't think competition needs to be mandated, but we don't think there needs to be unfair advantage either of one party over another when one party had used public moneys, public subsidies, tax dollars, and other subsidies...they had the advantage of building out their networks almost 100 years...a head-start on anybody else on this network build-out. We just want the level playing field. (The government should) get out of the way and let the market decide." Thus, some companies try to bypass the access difficulty to provide wireless services. One interviewee added, "The amount of money they (incumbent telephone companies) charged has made it impossible for us to compete....that is why we run the wireless because we did not want to try competing head-on, only to finally lose the battle". Although wireless broadband services can be differentiated from other DSL services in the market, they need to obtain a stable network connection either from ILECs or CLECs to realize the service.

At the very least, most interviewees expressed their fear about the disadvantageous deregulation by the FCC and the increasing difficulty to access to the last mile network. To put it simply, they could not raise enough capital for investments in deploying the residential broadband networks (the last mile facility). The executives of CLECs currently providing the residential broadband access services worry about the increasing price of ILECs' network facilities with one voice. A few interviewees admitted that their companies have already faced increasing prices and one interviewee stated that his/her company stopped providing the residential broadband service a year ago because of low profitability since the policy change. It is presently focusing on the business market.

On the other hand, one interviewee belonging to an incumbent LEC suggested "the vast majority of CLECs failed because they had unrealistic business plans that had no basis in reality" and they could not compete well against the incumbents because they had no ability to provide a triple service,⁸ which was expressed as a killer application in the near future.

Thus, in general, the primary barrier to entry for CLECs is the access to, and pricing of last mile facilities by ILECs. The impact of the Triennial Review Remand Order (TRRO) in Dec. 2004 and certain FCC forbearance orders have diminished the availability of TELRIC priced UNE loops (FCC, 2005, Feb.). Moreover the lack of special access reforms by the FCC continues to enable the ILECs' to overprice DS-1 broadband loops that are a critical component of small business services provided by CLECs. The interviewees uniformly argued that the government should make sure that there is equal access to the local loop under cost-based pricing on a non-discriminatory basis.

The FCC reports that CLECs reported providing 36% of their end-user switched access lines over their own local loop facilities, 42% by using unbundled network elements (UNEs) they leased from other carriers, and 22% through resale arrangements with unaffiliated carriers. Incumbent LECs reported providing about 22% fewer UNE loops with switching (referred to as the UNE-Platform) to unaffiliated carriers at the end of June 2006 than they reported six months earlier (8.4 million compared to 10.8 million) and about 1% fewer UNE loops without switching (4.4 million compared to 4.5 million) (Table 5) (FCC, 2007b).

⁸ Triple play refers to telecom carriers or cable companies offering a bundle of video, Internet, and phone services. A good example is Verizon's FiOS (fiber-optic services) triple-play offering (Wright, 2006, Nov.23).

Table 5. Reporting Competitive Local Exchange Carriers (End-User Switched Access Lines in Thousands)

Date	CLECs Reporting	Total End-User Lines	Acquired from Other Carriers		CLEC-Owned Lines ²	Percent		
			Resold Lines	UNEs ¹		Resold	UNEs	CLEC-Owned
Dec 1999	81	8,194	3,513	1,959	2,723	42.9%	23.9%	33.2%
Jun 2000	78	11,557	4,315	3,201	4,042	37.3	27.7	35.0
Dec 2000	89	14,871	4,114	5,540	5,217	27.7	37.3	35.1
Jun 2001	91	17,275	3,919	7,580	5,776	22.7	43.9	33.4
Dec 2001	94	19,653	4,250	9,332	6,072	21.6	47.5	30.9
Jun 2002	96	21,645	4,478	10,930	6,236	20.7	50.5	28.8
Dec 2002	112	24,864	4,677	13,709	6,479	18.8	55.1	26.1
Jun 2003	125	26,985	4,887	15,728	6,370	18.1	58.3	23.6
Dec 2003	136	29,775	4,842	17,888	7,045	16.3	60.1	23.7
Jun 2004	137	32,034	4,927	19,624	7,483	15.4	61.3	23.4
Dec 2004	149	32,881	5,417	18,961	8,503	16.5	57.7	25.9
Jun 2005	326	33,975	5,826	19,025	9,124	17.1	56.0	26.9
Dec 2005	382	31,388	6,704	14,521	10,163	21.4	46.3	32.4
Jun 2006	399	29,782	6,549	12,546	10,687	22.0	42.1	35.9

Only LECs with at least 10,000 lines in a state were required to report through December 2004. Beginning with the June 2005 data all LECs are required to report. Figures may not add to totals due to rounding. Some data have been revised for June and December 2005.

¹ Includes unbundled network element (UNE) loops leased from an unaffiliated carrier on a stand-alone basis and also UNE loops leased in combination with UNE switching or any other unbundled network element.

² Lines provided over CLEC-owned "last-mile" facilities.

Incumbent phone companies' predatory retail pricing & overpricing access

A total of nine interviewees criticized the so called "predatory pricing" of incumbent telephone companies, such as a \$14.95 per month package for the lowest class of DSL service.⁹ This is an introductory and promotional pricing plan but the problem is that their low customer pricing hurts competitors' profitability and competitiveness. When CLECs and ISPs have to pay

⁹ More recently, Verizon started to offer a \$9.99 package for 768kbps broadband service in promotion periods in case of Internet ordering only. This service was perceived among respondents as being possible by the incumbents' economies of scale and previous investment in building the database over a long time.

more for the leased networks than the ILECs' retail price, the competitors' business plans in the residential market cannot become sustainable.

On the other hand, as indicated previously, the ILECs' overpricing access and interconnection have been perceived as problematic. Interviewees stated, "Outrageous price for leased DSL lines", "overpricing of ILECs (for leasing networks)" and "the wholesale prices of DSLended up being about 8 times more." In the end, "(incumbent telephone companies) can charge content providers and users more because they can drive up the price...there are no alternatives. The reason there is no alternative is because potential alternatives would have to interconnect with them to connect the customers and contents."

Political power of incumbents biasing the regulation and legislation

All non-incumbent interviewees acknowledged the political power of incumbents resulting in biases in regulation and legislation. "The government should've done a better job enforcing the 1996 Act but they won't do it because the telephone companies have too much money, and are politically powerful. If they have good lawyers, they just don't enforce it." In particular, the ILECs have consolidated to an extent that they create a dominant market power that is hard to be beaten by anyone. One interviewee said, "Another issue is also the very consolidation of the industry proven to be difficult to be handled. Verizon MCI, AT&T SBC Bell South, (they are all) building power houses....some intention of making market agreements, interconnection agreements, more powerful incumbents have much more resources and bargaining power than competitors do."

Difficulty in access to capital due to regulatory uncertainty

Most of CLEC interviewees mentioned their difficulties in raising capital as a significant barrier to investment. They believe that regulatory uncertainty causes the trouble to raise capital in the market. As a result, lack of necessary capital prevents new entrants from entering the residential broadband market in the first place. One interviewee exemplified the situation by stating, "There is no way that an investor is going to loan millions of dollars, probably billions of dollars to somebody who wants to put in a third wire...investors believe that if you got two competitors dividing the revenue in half, each competitor has enough revenue to cover their costs but if you have three competitors, each only getting one third, that would not be enough to cover the cost."

This perception is prevalent among respondents as shown in their statements, "The problem we've got right now is that there is a conflict in the law and there is a conflict within what is being touted by the FCC out of one side of their mouth, they say, hey we want competition, competition is good for the industry, look what we have done....Out of the other side of the FCC's mouth, they said that your competition is good but we really don't know how much competition is good." "The best thing for a marketplace is consistency. Regulatory instability hurts more than anything else because when you have inconsistency from legislative and regulatory standpoints, your capital markets retreat because they don't want to infuse the capital into the marketplace in which there is regulatory and legislative uncertainty."

Financial and technological limitations of alternative access technologies

All interviewees including one incumbent company were well aware that alternative access technologies would not be viable competitors in the near future because of their financial and technological limitations. They recognize that the incumbent cable modem and DSL platforms are more cost efficient and technologically superior to other access services, such as wireless and power line platforms. First, wireless broadband currently requires more spectrums to provide services of high enough quality to compete with DSL and cable modems. It was said that, “there are two constraints in wireless that drive up the costs. One is availability of spectrum; you have to have enough frequencies from the FCC. Once you’ve got the license for frequencies, you have to start to install antennas....As a wireless company adds new customers, each new customer divides the use of frequency and that lowers the capacity that each customer has...if the wireless company gets enough customers and they are sharing the frequency, each customer has broadband service that has capacity that is lower than the broadband service of wired companies. If you want to provide wireless service with the same quality of service as wired alternatives, those antennas would cost as much as wired networks.” “Wireless could be a competitor in 10 years but not now. Because of quality of service, no dependable carrier-class services without jitter, without interruption in the wireless services...very early phases in the municipal broadband, Wi-Fi and WiMax”

Obtaining the license for spectrum, costs requirements for building up wireless facilities, and technological issues, such as interference, are the most important barriers to entry for new entrants that want to use wireless access technologies because of increasing entry costs. Even though WISPs would not concern very much about the access to the last mile as far as they could get access to either ILECs or CLECs’ fiber optic networks, wireless access still depends on landline networks.

This belief is shared among all respondents as shown in following testimonials, “BPL is not cost-effective, and is more expensive than copper loop leased from ILECs. WiMax and certain wireless technologies are very helpful but those are in progress. Access to these technologies is still expensive. As for wireless access to the customers, you have to have a license, spectrum, and a radio that all cost a lot.” In addition, mesh networks using either WiFi or WiMax were mentioned as limited by the WISP interviewee. “(A mesh network) is viable in certain situations and in some situations, it doesn’t work very well. You can deploy a lot of access points and you can make a really strong signal situation and in narrow areas, the mesh networks work. In a big neighborhood or in trying to cover entire towns and counties, it doesn’t work very well.” WiMax was described as “completely overblown.” “It was designed for licensed users, carriers, it doesn’t handle interference very well...It is set up using licensed spectrum...It’s going to be only available to limited parties. Very few operators could afford to deploy it and afford the license.”

However, the interviewee from the incumbent LEC suggested putting the matter in a different way, “There are no barriers to entry by access technologies but the alternatives have been limited in that they are not able to provide a triple service. Wireless, its infrastructure could be still very expensive compared to traditional wireline services... One problem with alternative technologies like BPL is that they aren’t always capable of triple play.” Also, he argued that the government should make a real level-playing field to DSL companies in the triple play market

because currently telephone companies “unfairly” have to pay on average 20% more in taxes, fees and surcharges than cable companies.

The government’s role in removing the barriers to entry

Ensuring equal access on a non-discriminatory basis

Most interviewees argued that the role of the government should be to ensure open access to the incumbents’ last mile facilities including the DSL and fiber network elements. “They should be ensuring that there is unbundled access to facilities of all types at cost based rates. Access to copper, fiber, cellular, and WiMax...including even cable,” “No more forbearance of the 1996 Telecom Act provisions by the FCC” and “special access regulation and oversight by the FCC where adequate competition does not exist to protect retail and wholesale customers of ILEC's,” “An equal access to the local loop at cost-based pricing,” and “the last mile is still natural monopoly...the government should treat the last mile as a public utility the same way they do surface streets... the last mile should be a separate company. Its only job is to sell capacity to content providers, long-distance, ISPs, wireless providers” were mentioned.

The interviewees do not believe that “there exists sufficiently viable facilities-based competition as announced by the FCC. It was expressed as “a sort of propaganda” held by the government. They also pointed out the risks of a duopoly situation in the residential market. One interviewee argued, “If there are only two competitors, they are able to collude. They won’t really compete with each other they would find a way to communicate each other and slow down the process of introducing the new products. They can maximize profits they earn on their own investment and they want to use old investment until it breaks down.” “Duopoly never creates price competition. If you want benefits for consumers, you would have more than two providers.”

On the other hand, several interviewees argued that the government should have incumbent companies to separate the wired loop facilities from switching and server portion. “The biggest entry barrier is lack of separation between the wired portion of ILECs and switching portion of ILECs... The same price of facilities...wired loop has to be sold separately from switching groups...would be sold at the same price to anybody...we can’t get the fair pricing on loops and facilities.” “The simplest solution is (I would encourage) functionally separated facilities portions of phone companies from the switching and server providers’ portion of ILECs.” The interviewee added that facilities providers would be required to function on a non-discriminatory basis. “they would have to provide non-discriminatory service because they are a monopoly...I hope they provide the same price, same terms to me, that they would to the switching and server providers portion that came from the ILECs.”

Support the rural CLECs by allowing TELRIC pricing

On the other hand, one interviewee whose company is based in a rural area pointed out that if, without the UNE-P rule, rural CLECs were forced to accept the ILECs’ current commercial rate for port pricing, they would be driven out of the business because of an unbearable decline in profit margins, for instance from 20% to 0.9%. The respondent claimed

that “before the TRRO of the FCC, there was a 70% margin in the metropolitan areas and a 20% margin in rural areas” (Table 6).

Table 6. Pre and post TRRO affects on product margins

Description	Urban Markets		Rural Markets	
	Pre 3/2005 (TELRIC)	Post 3/2005	Pre 3/2005 (TELRIC)	Post 3/2005
Unbundled Loop Rate	\$9.64	\$9.64	\$30.59	\$30.59
“Port” Charge	1.70	9.70	1.70	9.70
Universal Service Funds	0.00	0.00	-3.43	-3.43
Total Wholesale Rate for Network Element Combinations	\$11.34	\$19.34	\$28.86	\$36.86
Average Retail Revenues	37.18	37.18	37.18	37.18
Product Margin (Retail Rate Minus Wholesale Rate)*	\$25.84	\$10.45	\$8.32	\$0.32
Gross Product Margin	69%	48%	22%	0.9%

Source) South East Telephone (2007)

He suggests that the disparity in the wholesale platform cost between metropolitan and rural markets not only gives ILECs an unfair advantage, but also negatively impacts rural consumers by creating a barrier to facilities construction by rural CLECs. In rural areas, with low population density, there is a two fold problem: (1) equipment costs are shared over fewer subscribers and (2) a greater number of co-locations are required to reach subscribers because of low population density (South East Telephone, 2007). Thus, he emphasized that regulations should encourage more CLECs and other technology companies to come into rural areas through the continuing implementation of the TELRIC pricing to the rural CLECs. Then, the companies could have served broadband to a lot more people if they did not have to build equipment on top of their competitors.

A government report (GAO, 2006) confirms that costs for what is known as backhaul are higher for rural areas and can affect the deployment of broadband networks in these areas. Backhaul refers to the transmission of information—or data—from any of a company’s aggregation points to an Internet backbone provider that will then transmit that data to any point on the Internet. Internet traffic originating from rural areas may need to travel a long distance to a larger city to connect to a major Internet backbone provider. Because the cost of transmitting over this distance—that is, the backhaul—can be high, backhaul costs are another barrier to deployment in rural areas.

Guarantee the spectrum availability for smaller competitors

One wireless provider stated, “There should be more unlicensed, low cost spectrum for wireless broadband deployment. If we had access to that, then manufacturers will build the equipment, (and) operators (will) come in to fill the gap. But if the government keeps the spectrum at a very high price, large companies would buy the spectrum, lock it up and at least it is necessary for regulators to come up with a way that big companies have a hard time trying to game the system because for every dime they spend on spectrum auctions, they spend a lot of money to try to figure out how to work the system to their advantages and mess them up for any smaller operators trying to get involved. They want to keep competitors to the minimum. I ask that the spectrum be as open as possible.”

More recently the FCC decided to auction off the 700 MHz wireless spectrum. Soon after, a group of wireless industry entrepreneurs asked the FCC to secure a portion of the spectrum for open access, which will contribute to innovation from entrepreneurs (Caulfield, B., 2007, June 8). Advocates of open access have been concerned that, if incumbent wireless companies were to win the spectrum auctioned by the government (as in most cases historically), the winners would delay the introduction of new services running on the spectrum while continuing to generate cash flow from existing wireless networks (Ozanich, Hsu, & Park, 2004).¹⁰ Indeed, a consortium of top cable companies and Sprint¹¹ won 137 licenses from an auction of the Advanced Wireless Services (AWS) spectrum in 2006 but has not moved rapidly to exploit it. Thus, this was criticized as the cable companies' warehousing strategy that hoards spectrum to blunt competition from possible rivals in providing Internet access (Hearn, 2007, June 18).

4. Discussion and Conclusion

Based on the mean ratings in this survey, the barriers to entry that are perceived as most important by the executives in this study are capital requirements, capital intensity, and the incumbents' control of essential facilities. This result is comparable with that of the previous research, which identified the cost advantages of incumbents as the most critical barrier (Karakaya and Stahl, 1989; 1992). This difference indicates the perceived importance of capital requirements and entry costs in the broadband access service market compared to other consumer and industrial markets. In addition to costs, the magnitude of sunk costs, the incumbents' cost advantages due to economies of scope, the incumbents' market shares, and the incumbents' cost advantages due to economies of scale are all important factors behind the new entrants' decision to enter the broadband market. The identified factors were consistent with those of previous studies (Karakaya, 2002; Karakaya & Stahl, 1989; Porter, 1980) and other telecommunications literature (Ford, et al., 2005; Xiao and Orazem, 2005; Rosston & Wimmer, 2001; Alexander & Feinberg, 2004; Brown & Zimmerman, 2004; Abel & Clements, 2001). In ranking items, most respondents gave the highest marks to the access to the last mile, economies of scale, economies of scope and capital requirements for entering the market compared to other barriers.

The factor analysis resulted in identifying four major latent variables that business executives consider when making market entry decisions. The first factor is "product differentiation," if controlled by incumbent firms, makes it difficult for new entrants to enter the markets. It was found that broadband subscribers tied with a long-term contract tend to adhere to the previous companies rather than easily jump over to other providers. Thus, heavy advertising by firms already in the market, customer loyalty advantage held by incumbents, brand

¹⁰ In an analysis of the spectrum auction experiences in the western European countries, Ozanich, et al. (2004) found four trends: "(1) 3-G network development and services have been delayed. (2) Payments to governments by the winning bidders have been delayed, and there have been requests to reduce the final bid amounts. (3) Companies are seeking mergers or network sharing agreements in order to reduce costs and decrease the number of competitors. (4) The delayed roll-out of networks is allowing the incumbent licensees to continue to generate revenues from existing 2-G networks (pp.231-232)."

¹¹ Cable-operator participants included Comcast, Time Warner Cable, Cox Wireless, and Bright House Networks.

identification advantage held by incumbents are all directly related to making the subscribers stay preceding choices. The amount of selling expense involved in marketing a product, the incumbent's easier access to distribution channels, incumbents with cost advantages due to learning curves, incumbents with superior production processes and trade secrets held by incumbent firms all contribute to the product differentiation indirectly. However, if new entrants are able to differentiate their product, it can be an advantage to them as well. According to Ford, et al. (2005), product differentiation between intermodal competitors would be stronger than between intramodal competitors. The product differentiation factor in the broadband market explains the biggest variance of the responses in this study.

The second factor, "absolute cost advantages of incumbents" includes incumbents with essential facilities such as the last mile networks, incumbents with cost advantages due to economies of scale, incumbents with cost advantages due to economies of scope, and incumbents with relatively easy access to necessary equipments and supplies (e.g., vertical integration). All of these factors indicate the incumbents' propriety advantages because the incumbents in the broadband market, typically ILECs and local monopoly cable operators, entered the market a hundred year or decades ago, respectively, and deployed the networks system with the government protection. Telephone companies have even been subsidized from the universal service funds. Thus, we can imagine that the asymmetrical cost difference would be extremely difficult to be overcome by new entrants. Furthermore, when incumbent telecom carriers and cable companies are in the process of transition to delivering triple play services, new entrants with absence of the capability would be disadvantaged in the competition (Belson, 2006, Dec. 10).

The third factor "post-entry profitability" can influence a firm's entry decision in both positive and negative ways. When the incumbent companies are enjoying high profit margins, this situation may encourage new entrants to desire to enter the market. Also, once new entrants enter a market where the incumbents currently earn high profits, they would expect strong retaliation from the incumbent firms in the form of price reductions, increased promotional expenditures or other means of post-entry strategies (Karakaya, 2002). Rosenberg and Clements (2000) found that an ILEC deters entry by reducing or eliminating the potential competitor's profit opportunities by forcing high costs.

The fourth factor, "entry costs," contains capital requirements, capital intensity and sunk costs and government policy. This factor is perceived to be significantly more important than the other factors in deterring market entry. This result seems intuitive because the residential broadband market generally requires lots of capital investment even for the network system, and additional costs to deal with end users, such as extensive customer service and technicians, are prohibitive. As for wireless access providers, an exorbitant price for a spectrum license would be one of the biggest deterring factors.

In addition to the factors identified from the survey data, the in-depth interviews conducted with company executives produced major five themes. The difficulty of access to the networks (the presence of essential facilities), the overpricing of leased lines by the ILECs to drive up new entrants' costs, the ILECs' predatory pricing to consumers, the political power of incumbents biasing the regulation and legislation, difficulty in access to capital in the presence of regulatory uncertainty, and the financial and technological limitations of alternative access technologies. These results are entirely consistent with the survey results. Most interviewees, whether they belong to CLECs or independent broadband ISPs, have been afraid of the potential

negative impacts of the FCC's withdrawal from the open access policies that the commission had previously pursued. The interviewees asked that the government should continue to implement the pro-competition provision of the Telecommunications Act of 1996 in a comprehensive manner and ensure equal access to the ILECs' monopolized networks on a non-discriminatory cost-based pricing. One interviewee indicated that the current deregulatory situation ironically creates an artificial competition and decides the number of competitors rather than let the market decide as Congress intended to in the beginning.

5. Limitations and Future Research

This study was based on a small sample of 53 executives from broadband ISPs. Even though the number of cases is good enough for detecting the structure statistically, the results may not represent the population. A larger sample size would allow researchers to test differences among broadband service providers with different access technologies. Since the target was company executives mostly of the highest rank, the response rate was not quite high. It was also difficult to make an appointment with them for a phone interview. Furthermore, given that recruitment was on a voluntary basis, we could not obtain interviews from satellite, BPL and cable modem providers. However, the interviews with 13 executives complemented the survey well because they are currently in the business and have the practical knowledge of the competition level among alternative access technologies and the broad market circumstances. Finally, we could identify the major issues affecting market entry would-be third competitors in the residential broadband access market. Future studies of this type could attempt to increase the sample size and the number of interviewees.

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